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Japanese Kokai Patent Application No. Hei 5[1993]-95978

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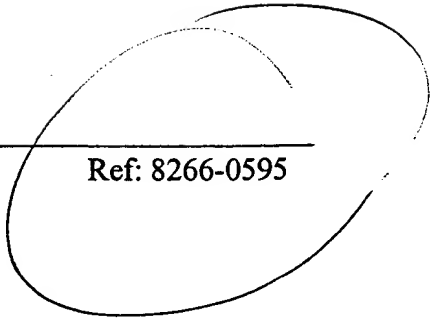
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CONTROL SYSTEM FOR MOTOR-DRIVEN BED

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[There are no amendments to this patent.]

Abstract

Objective

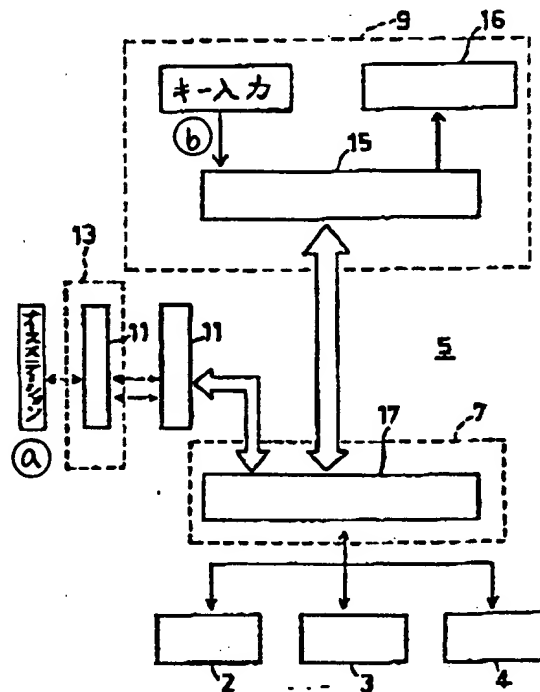
To incorporate microcomputers into a remote control switch and a control box in order to transmit and receive a control signal.

### Constitution

Microcomputers 15 and 17 are mounted on remote control switch 9 and control box 7, a four-core cable is applied for transmitting a signal, and infrared transmitter-receiver 11 is applied. In addition, infrared transmitter-receiver 11 is provided on the outer side of [head]board 10 of bed 1, and infrared transmitter-receiver 11 is provided on repeater 13 provided on the wall 12 of a hospital room in order to transmit/receive various kinds of information to/from a nurse station.

### Effect

Because microcomputers 15 and 17 are incorporated, the cable needs to have only four cores or so in order to achieve multifunctionality. In addition, because infrared rays are adopted as a means to transmit/receive a control signal, external perturbations can be well tolerated, and any system can be utilized selectively in a hospital room where infrared transmitter-receiver 11 is provided on repeater 13 [provided] on wall 12.



Key: a      Key input  
       b      Nurse station

### Claims

1. A control system for a motor-driven bed characterized by having a configuration in which a control box for transmitting an operation control signal to a motor serving as a driving

source of a motor-driven bed, a remote control switch with built-in actuation switches to be provided near a patient's pillow, and an infrared transmitter-receiver provided on the outer side of the [head]board of the motor-driven bed are provided; an infrared transmitter-receiver is provided on a repeater provided on the wall of a hospital room in order to transmit/receive various kinds of information between a nurse station and the hospital room; and the aforementioned remote control switch and the control box as well as the control box and the infrared transmitter-receiver provided on the outer side of the [head]board are connected respectively using a cable.

2. A control system for a motor-driven bed characterized by having a configuration in which a control box for transmitting an operation control signal to a motor serving as a driving source of a motor-driven bed, a remote control switch with built-in actuation switches to be provided near a patient's pillow, and an infrared transmitter-receiver provided on the outer side of the [head]board of the motor-driven bed are provided; an infrared transmitter-receiver is provided on a repeater provided on a wall of a hospital room in order to transmit/receive various kinds of information between a nurse station and the hospital room, and infrared transmitter-receivers are provided on one side of the bed and on the control box in order to transmit/receive a signal between the aforementioned remote control switch and the control box; and the aforementioned control box and the infrared transmitter-receiver provided on the outer side of the [head]board are connected using a cable.

3. A control system for a motor-driven bed characterized by having a configuration in which a control box for transmitting an operation control signal to a motor serving as a driving source of a motor-driven bed, a remote control switch with built-in actuation switches to be provided near a patient's pillow, and an infrared transmitter-receiver provided on the outer side of the [head]board of the motor-driven bed are provided; an infrared transmitter-receiver is provided on a repeater provided on a wall of a hospital room in order to transmit/receive various kinds of information between a nurse station and the hospital room, and infrared transmitter-receivers are provided on the aforementioned remote control switch and on one side of the bed, and said infrared transmitter-receivers provided on the bed side and the control box are connected using a cable; and the infrared transmitter-receivers provided on the control box and on the outer side of the [head]board are connected using a cable.

4. A control system for a motor-driven bed characterized in that in the control systems described under Claims 2 and 3, the configuration includes a remote control switch and several infrared transmitter-receivers provided on the sides of the bed for transmitting/receiving a signal.

## Detailed explanation of the invention

[0001]

### Industrial application field

The present invention pertains to a control system for a motor-driven bed for which wiring-related problems have been solved in a motor-driven bed with multifunctionality.

[0002]

### Prior art

As a conventional method for supplying an operation control signal to a motor serving as a driving source of a motor-driven bed, a cord-based remote control system in which an operation control signal is transmitted to the motor via a cord by means of a key input operation using a remote control switch with built-in operation switches provided near a patient's pillow has been adopted.

[0003]

### Problem to be solved by the invention

Thus, when the contents controlled using the remote control were to be provided with multifunctionality, circuitry required for the configuration became complicated, resulting in a problem of an extremely involved wiring operation. The present invention was achieved to cope with this kind of inconvenience, and its objective is to present a control system for a motor-driven bed in which microcomputers are incorporated into a remote control switch and a control box for the transmission/reception of a control signal.

[0004]

### Means to solve the problem

In order to solve the aforementioned problem, the present invention is characterized by having a configuration in which a control box for transmitting an operation control signal to a motor serving as a driving source of a motor-driven bed, a remote control switch with built-in actuation switches to be provided near a patient's pillow, and an infrared transmitter-receiver provided on the outer side of the [head]board of the motor-driven bed are provided; an infrared transmitter-receiver is provided on a repeater provided on the wall of a hospital room in order to transmit/receive various kinds of information between a nurse station and the hospital room; and the aforementioned remote control switch and the control box as well as the control box and the infrared transmitter-receiver provided on the outer side of the [head]board are connected respectively using a cable. In addition, the present invention is characterized as having a configuration in which a control box for transmitting an operation control signal to a motor

serving as a driving source of a motor-driven bed, a remote control switch with built-in actuation switches to be provided near a patient's pillow, and an infrared transmitter-receiver provided on the outer side of the [head]board of the motor-driven bed are provided; an infrared transmitter-receiver is provided on a repeater provided on a wall of a hospital room in order to transmit/receive various kinds of information between a nurse station and the hospital room, and infrared transmitter-receivers are provided on one side of the bed and on the control box in order to transmit/receive a signal between the aforementioned remote control switch and the control box; and the aforementioned control box and the infrared transmitter-receiver provided on the outer side of the [head]board are connected using a cable. In addition, the present invention is characterized as having a configuration in which a control box for transmitting an operation control signal to a motor serving as a driving source of a motor-driven bed, a remote control switch with built-in actuation switches to be provided near a patient's pillow, and an infrared transmitter-receiver provided on the outer side of the [head]board of the motor-driven bed are provided; an infrared transmitter-receiver is provided on a repeater provided on a wall of a hospital room in order to transmit/receive various kinds of information between a nurse station and the hospital room, and infrared transmitter-receivers are provided on the aforementioned remote control switch and on one side of the bed, and said infrared transmitter-receivers provided on the bed side and the control box are connected using a cable; and the infrared transmitter-receivers provided on the control box and on the outer side of the [head]board are connected using a cable. Furthermore, in the aforementioned control system, the configuration includes a remote control switch and several infrared transmitter-receivers provided on the sides of the bed for transmitting/receiving a signal.

[0005]

#### Operation of the invention

As a key input is entered into a remote control switch, said key input is converted into a prescribed control signal and transmitted to a control box via a cable in order to drive a motor. In addition, if a signal to a nurse station is included in the control signal, said signal is converted into an infrared signal by an infrared transmitter-receiver provided on the outer side of the [head]board and emitted to an infrared transmitter-receiver provided on a repeater. Then, the signal from the bed is transmitted to the nurse station from the repeater as soon as it is received.

[0006]

In addition, in the case of a system in which infrared transmitter-receivers are provided on one side of a bed and on a control box in order to transmit/receive a signal between a remote control switch and the control box, a key input entered using a remote control switch is converted

into a prescribed control signal, and said control signal is transmitted to an infrared transmitter-receiver provided on the bed side via a cable. In said infrared transmitter-receiver, [said control signal] is converted into an infrared signal and received by the infrared transmitter-receiver provided on the control box. Then, a motor is driven in accordance with the aforementioned infrared signal. Furthermore, when infrared transmitter-receivers are provided at several places, the remote control switch can be used by connecting it to the most convenient location.

[0007]

Moreover, in the case of a system in which an infrared transmitter-receiver is provided on a remote control switch in order to transmit/receive information by means of an infrared signal to/from a control box and a repeater, not only the transmission/reception of data between the remote control switch and an infrared transmitter-receiver provided on a bed side can be achieved by means of infrared rays, and the signal is transmitted to the control box via a cable, but also the infrared signal can be transmitted directly from the remote control switch to an infrared transmitter-receiver provided on the repeater. With such a system, because only intra-bed wiring is required, and no restrictions are imposed upon the remote control switch by a cable, the remote control switch can be kept anywhere. In addition, when infrared transmitter-receivers are provided at several places along the side of the bed, the remote control switch can be operated from the most convenient location.

[0008]

As described above, because infrared rays are adopted as a means to transmit/receive a control signal, external perturbations can be easily tolerated, and any of the above system can be utilized selectively in a hospital room where an infrared transmitter-receiver is provided on a repeater [provided] on the wall.

[0009]

#### Application example

An application example of the control system for a motor-driven bed pertaining to the present invention will be given next, and it will be explained in reference to attached figures. Furthermore, ① a wired remote control system, ② a semi-wired remote control system, and ③ a wireless remote control system, which are distinguished according to the method utilized for transmitting/receiving a signal between the remote control switch (to be described later) provided near a patient's pillow and the control box for the motor serving as a driving source, can be applied to said control system.



[0010]

First, hospital room bed 1 equipped with a control system of a ① wired remote control system is shown in Figure 1. Said bed (1) is a motor-driven bed provided with motors 2, 3, and 4 serving as driving sources of the motor-driven bed wherein control system 5 for controlling said motors (2 through 4) is provided. Said control system (5) has control box 7 connected to motors 2 through 4 via signal lines 6 and remote control switch 9 provided near a patient's pillow and connected to control box 7 via cord 8 made of a four-core cable. In addition, infrared transmitter-receiver 11 is provided on the outer side of [head]board 10 of bed 1, and infrared transmitter-receiver 11 is provided on repeater 13 provided on side wall 12 of a hospital room in order to transmit/receive various kinds of information to/from a nurse station. In the configuration, aforementioned control box 7 and infrared transmitter-receiver 11 provided on the outer side of [head]board 10 are connected using cord 14 made of a four-core cable.

[0011]

Here, a block diagram of the aforementioned control system of a ① wired remote control system is shown in Figure 2 in order to describe it in further detail. That is, remote control switch 9 has built-in microcomputer 15. Furthermore, although not illustrated, said microcomputer (15) is configured basically with a central processing unit (CPU), memories (ROM and RAM), and an input/output device (I/O port). In other words, microcomputer 15 can function to convert a key signal into serial data upon receiving it from remote control switch 9 and to transmit a display signal as a control signal to control box 7 via cord 8 while supplying it also to display means 16. Like remote control switch 9, aforementioned control box 7 is equipped with microcomputer 17 in order to function to supply driving control signals to motors 2 through 4, to take in signals pertaining to the operation status of motors 2 through 4, and to supply a signal to be transmitted to a nurse station to infrared transmitter-receiver 11 provided on the outer side of [head]board 10. The configuration is as such that [said signal] is converted into an infrared signal at aforementioned infrared transmitter-receiver 11 provided on the outer side of [head]board 10 and transmitted to infrared transmitter-receiver 11 provided on repeater 13.

[0012]

In control system 5 of the wired remote control system with the aforementioned configuration, when a key input is entered into remote control switch 9, the resulting key signal is converted into serial data by microcomputer 15 and transmitted to microcomputer 17 in control box 7 via cord 8 whereby driving control signals are supplied to motors 2 through 4 in order to drive motors 2 through 4. In addition, microcomputer 17 in aforementioned control box

7 takes in signals pertaining to the operation status of motors 2 through 4 and outputs them to microcomputer 15 in aforementioned remote control switch 9 via cord 8, and said signals are converted into prescribed display signals to be displayed on display means 16, so that the patient can grasp the operation status of motors 2 through 4. Furthermore, the signals pertaining to the operation status of motors 2 through 4 and key signals are transmitted to infrared transmitter-receiver 11 provided on the outer side of [head]board 10 via cord 14, converted into infrared signals at infrared transmitter-receiver 11, and emitted to infrared transmitter-receiver 11 provided on repeater 13. Then, because these signals are sent to the nurse station from repeater 13 as soon as they are received, not only [the condition of] the patient but the condition of the bed of said patient can also be monitored at the nurse station.

[0013]

Next, control system 20 based on a ② semi-wired remote control system having a configuration in which infrared transmitter-receivers 11 are provided along the side of the bed and on control box 7, and a signal is transmitted/received between remote control switch 9 and control box 7 will be explained using Figure 3. In this application example, those constituents with substantially the same functions as those of the aforementioned application example are assigned the same symbols, and their explanations will be omitted.

[0014]

Control system (20) has a configuration in which infrared transmitter-receivers 11 are provided along the side of bed 1 and on control box 7 in order to transmit/receive a signal between aforementioned remote control switch 9 and control box 7. In addition, in said configuration, aforementioned infrared transmitter-receivers 11 are provided on both sides of bed 1 whereby cord 8 of remote control switch 9 can be connected selectively for patient convenience.

[0015]

In addition, a block diagram of such control system (20) is shown in Figure 4 wherein a signal from microcomputer 15 on remote control switch 9 [is sent to] infrared transmitter-receiver 11 provided on a bed side via cord 8, converted into an infrared signal by said infrared transmitter-receiver (11), and taken into microcomputer 17 in control box 7 via infrared transmitter-receiver 11.

[0016]

Therefore, in the case of control system 20 which adopts a semi-wired remote control system, a key signal converted into serial data by microcomputer 15 in remote control switch 9 is transmitted via cord 8 to infrared transmitter-receiver 11 provided along the side of bed 1, converted into an infrared signal by said infrared transmitter-receiver 11, and taken into infrared transmitter-receiver 11 provided on control box 7. Then, it is supplied from microcomputer 17 to motors 2 through 4, and motors 2 through 4 are driven according to the key signal.

[0017]

Control system 30 of a ③ wireless remote control system is shown in Figure 5. This control system 30 has a configuration in which infrared transmitter-receiver 11 is provided on remote control switch 9 in order to transmit/receive information by means of an infrared signal to/from control box 7 and repeater 13. In this case, infrared transmitter-receiver 11 provided along the side of bed 1 is connected to control box 7 using an extension cord from infrared transmitter-receiver 11. In addition, as shown in Figure 6, the configuration allows a signal to be transmitted/received between remote control switch 9 and repeater 13 through infrared transmitter-receivers 11.

[0018]

With such system, transmission/reception of data between remote control switch 9 and infrared transmitter-receiver 11 provided along the side of bed 1 is realized by means of infrared rays, and the signal is sent to control box 7 via extension cord 31. Also, an infrared signal can be transmitted directly to infrared transmitter-receiver 11 provided on repeater 13. Thus, because wiring needs to be implemented only inside bed 1, and no restrictions are imposed upon the control switch 9 by cord 8, remote control switch 9 can be kept anywhere.

[0019]

Various systems have been described above. In any case, because remote control switch 9 and control box 7 are provided with microcomputers 15 and 17 for the transmission/reception of a signal as well as for carrying out signal processing, the cable needs to have only four cores or so in order to achieve multifunctionality. In addition, because infrared rays are adopted as a means to transmit/receive a control signal, external perturbations can be easily tolerated, and any one of the aforementioned systems can be utilized selectively in a hospital room where infrared transmitter-receiver 11 is provided on repeater 13 [provided] on wall 12.

[0020]

#### Effect of the invention

As described above, in the present invention, (1) because serial data communication is adopted in the ①wired remote control system, ② semi-wired remote control system, and ③ wireless remote control system, not only can the number of cores of the cable be reduced, but transmission/reception of complex control signals (communication with the nurse station and data pertaining to bed conditions and motor problems) can also be realized. In addition, (2) because the control signal is transmitted by means of light, noise can be well tolerated. In addition, (3) because wiring between the control box and the remote control switch is no longer needed, good installation work efficiency can be achieved; and because the control box and the remote control switch are configured independently, faults are less likely to occur, so that maintenance becomes easier. In addition, (4) because several control signal transmission/reception units are provided, a desired remote control switch insertion location can be selected. In addition, (5) when a fixed control board is attached to the bed frame, it can be used also as a remote control switch. Furthermore, (6) a desired system can be selected according to the situation around the bed.

#### Brief description of the figures

Figure 1 is a diagram showing an application example of a wired remote control system used as the control system of a motor-driven bed pertaining to the present invention.

Figure 2 is a block diagram showing the configuration of the control system of the motor-driven bed shown in Figure 1.

Figure 3 is a diagram showing an application example of a semi-wired remote control system used as the control system of a motor-driven bed pertaining to the present invention.

Figure 4 is a block diagram showing the configuration of the control system of the motor-driven bed shown in Figure 3.

Figure 5 is a diagram showing an application example of a wireless remote control system used as the control system of a motor-driven bed pertaining to the present invention.

Figure 6 is a block diagram showing the configuration of the control system of the motor-driven bed shown in Figure 5.

#### Explanation of reference symbols

1	Bed
2, 3, 4	Motor
5, 20, 30	Control system
6	Signal line

- 7 Control box
- 8, 14 Cord
- 9 Remote control switch
- 10 [Head]board
- 12 Wall
- 13 Repeater
- 15, 17 Microcomputer
- 16 Display means

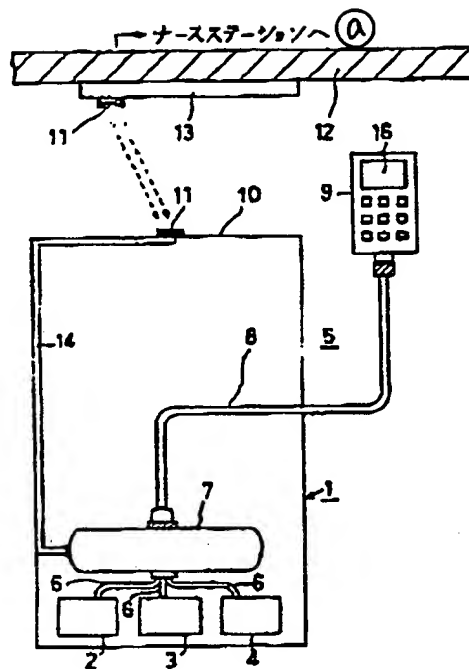


Figure 1

Key: a To nurse station

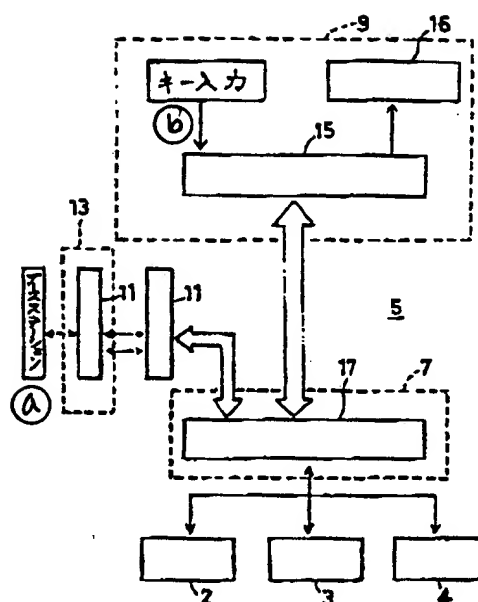


Figure 2

Keys: a      Nurse station  
           b      Key input

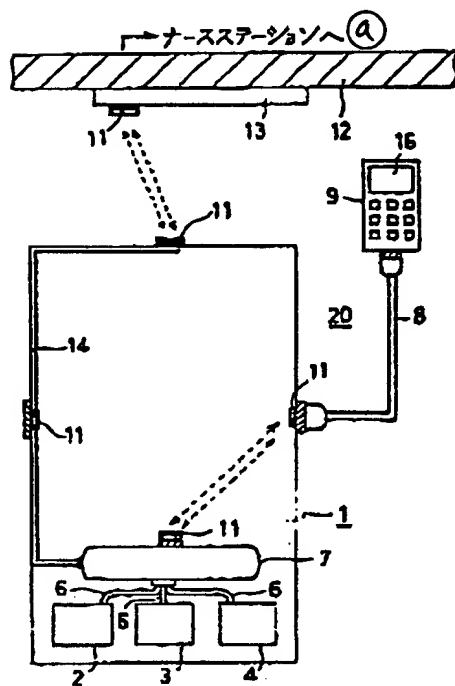


Figure 3

Key: a      To nurse station

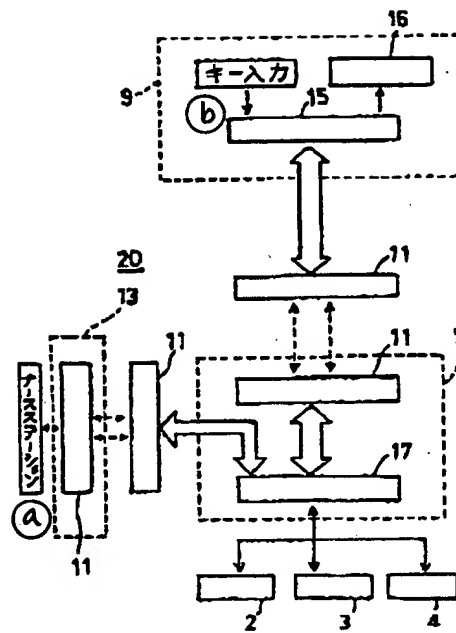


Figure 4

Keys: a      Nurse station  
b      Key input

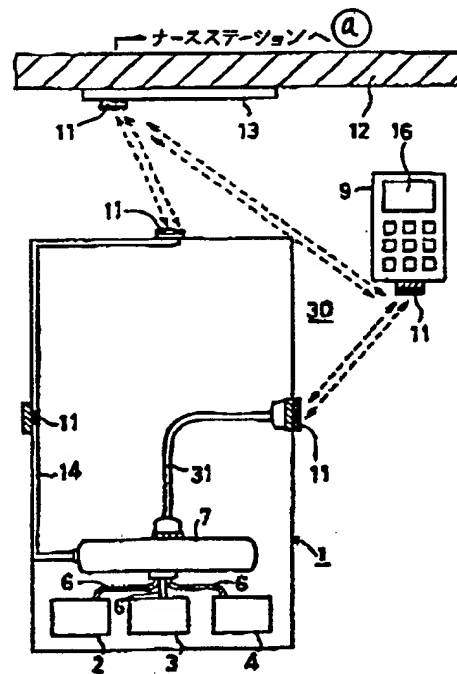


Figure 5

Key: a      To nurse station